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ABSTRACT

The purpose of this paper is twofold. First, it provides the background to and describes the evolution of a major State University of New York (SUNY) research and development effort to create and demonstrate a unique model of learning which delivers interactive, multimedia mathematics curriculum to learners in their homes. This model was developed with support from the U.S. Department of Education, SUNY, the Syracuse City School District, New York City Districts #5 and #12, Adelphia Cable, Cablevision, and Instructional Systems, Inc. This model involved teaching mathematics through the use of cable television and computer assisted instruction (CAI). Second, the paper describes a number of other recent SUNY efforts to forge cooperative efforts between SUNY campuses and K-12 schools to shape and apply learning technologies in support of student instruction and teacher training in local schools, workplaces, and homes. The projects described are: distance learning efforts; "Regents Review Live," a series of 2-hour review courses to help students prepare for New York State Regents exams; and satellite-delivered professional development for both preservice and inservice teachers. It is also noted that SUNY Central played a major role in the creation of the Great Lakes Collaborative, a three-state network of 81 schools connected via Internet. Contains five figures and three appendixes. (Author/JLB)

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SUNY/K-12 Learning Technology Partnerships for Enhancing Educational Opportunities in Schools and Homes

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SUNY/K-12 Learning Technology Partnerships for Enhancing Educational Opportunities in Schools and Homes

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Abstract

The purpose of this paper is twofold. First, it provides the background to, and describes the evolution of a major SUNY research and development effort to create and demonstrate a unique model of learning which delivers interactive, multimedia mathematics curriculum to learners in their homes. This model was developed with support from the U.S. Department of Education, the State University of New York, the Syracuse City School District, New York City Districts #5 and #12, Adelphia Cable, Cablevision and Instructional Systems, Inc. Second, the paper describes a number of other recent, SUNY efforts to forge cooperative efforts between SUNY campuses and K-12 schools to shape and apply learning technologies in support of student instruction and teacher training in local schools, workplaces and homes.

November 1994

I. The SUNY Developmental Project to Deliver Mathematics Instruction into Student Homes

A. Background

The Promise

The media is filled with news of the emerging "electronic highway" with promises of a myriad of information and consumer services brought to living rooms, the work place, and schools at all levels across the United States. Economic and political viability of such potential is underscored by the frenzy in the corporate telecommunications sector to joint venture, merge, and acquire and the government exposure and support being demonstrated by the President, Vice President and many federal agencies. A recent projection by Forrester Research of Cambridge, Massachusetts, indicates that the "on-line market," fueled by data sharing and purchase of goods and services on a global scale, will grow from its current $530 million to a $3 billion industry by 1998. This, and other projections, make the economic incentives for the development of in-home, multi-media consumer services very clear.

For those of us in the education and training enterprise, the opportunity to deliver multi-media education and training to living rooms across the country via cable television, telephone services, and other emerging wireless carriers, represents an exciting new perspective on what the lucrative "home improvement" market will soon be. Students needing supplementary assistance or seeking enrichment courses; parents seeking a GED, college courses, or training to improve job skills; corporations desiring to upgrade employee competency will all soon have these opportunities delivered to homes, the workplace, and community learning centers all across the United States and beyond. New technical capacity will combine the power of the computer-assisted-instruction systems and the motivational attraction of video and sound in an interactive, multi-media electronic array of lifelong learning opportunities within reach of everyone in the world. However, as

professional educators, we must keep the learners and their needs as the central focus of our efforts.

Central Strategies

Nearly all public and private educational organizations from K-12 to adult continuing education have embraced the promise of these technological capacities for the purposes of increasing learner access, improving the quality of teaching and learning, and enhancing the productivity of the institution, the faculty, and the learners themselves. The efforts to harness educational technology pursued by most educational organizations incorporate several basic assumptions or strategic underpinnings. First among these is the assumption that whatever is developed that integrates the emerging technologies, the finished product or process will be educationally significant. That is, it will meet real learning needs, it will enhance or extend access either geographically or in time, it will demonstrate positive, cognitive and affective results, and it will enhance the productivity of the institutions and individuals involved. A second desirable strategic objective is making the application as widely available in the community as possible. This objective relates to the emerging shift in the role of professional educators from disseminators of information to managers of learning. The most creative of our nation's educators will view that new role as not just related to the current model of instruction, confined to classroom settings, but will have the vision to see that this new model extends to the community itself, thereby thrusting the superintendent of a local school district into the role of community learning manager. Such a role assumes that the professional educator in charge is aware of, can engineer and arrange for the capacity to deliver learning opportunities needed by local corporations, students in need of remediation, workers seeking to upgrade skills to enable new job opportunities, public assistance recipients, family members seeking employability skills, the disabled who cannot leave their homes, non-English speaking workers, and incarcerated youth serious about reentering the job market. The new technological delivery system will indeed provide for the development of capacity that is widely applicable to a variety of learners in a variety of community sites.

The third underlying assumption of a deliberate effort to effectively

deploy technology for educational purposes must be to work toward the integration of the technology in support of what we know is solid learning theory and sound educational practice. Also, it is important that educators be sufficiently informed of the technological capacities to oversee and suggest how the technologies might be integrated among themselves to most effectively address the objectives of access, quality, and productivity.

Last, as is evidenced by the foregoing assumptions, it is impossible for any current public or private educational organization to undertake deliberate and effective efforts to integrate technology without doing so in collaboration with other educational and training organizations, with organizations in the commercial sector representing the educational software and hardware development sector, and those corporations involved in the development of regional, national, and global telecommunications transport services. These underlying strategic elements of...

- educational significance,
- wide applicability and access,
- integration with educational practice and among the technologies themselves,
- collaboration among key partners,...

are central to successful efforts to apply and shape the new learning technologies in support of resolving this country's persistent and difficult education and training needs.

B. Needs and Direction

The need to improve our system of public education and the relationship of its failings to our economic health and competitiveness is clear and needs no belaboring. One can easily recite the litany of studies and reports accomplished over the last decade that point to deficiencies in our K-12 public education system, and underscore the importance of developing a new model for learning and training in that sector. There is an array of state and national efforts labelled "Systemic Initiatives", "Systemic Reform", "School System Restructuring" and there has been a

focus of attention given by Governors and the previous and current administrations at the national level resulting in agreement regarding "national education goals". These highly visible efforts have all been undertaken because the needs are abundantly clear and the goals of a myriad of publicly funded programs are designed to address those needs. At the post-secondary sector, similar reports and initiatives have been developed, some that indicate the lack of relevance between courses of study and jobs in the marketplace. Other reports indicate the frightening extent to which public university systems supplement the education of entering freshmen to prepare them to achieve a sufficient level of basic skill competencies to operate effectively in their freshman year. The State University of New York spends approximately $75 million per year for this purpose. Consider what the national amount must be for supplementing the education of high school graduates to enable reasonable pursuit of freshman college coursework.

The affect of the recession and the numbers of displaced workers have caused a tremendous need for the retraining of our manufacturing based workforce. In the corporate sector itself, education and training is reported to be an enterprise representing an annual magnitude of $40 billion.

Though the needs are clear in all of the learning sectors in our country, the initial focus of the SUNY developmental project is in the area of mathematics. This focus is supported by a U.S. Department of Education report released in September 1993 indicating that only 16% of the 4th graders, 8% of the 8th graders and 9% of the 12th graders were able to solve and explain answers to problems that required understanding and application of math principles and operations. The focus on mathematics is also consistent with the curriculum efforts of the New York State Education Department, the needs detailed in the SUNY "Entry Level Skills Study", and the SUNY "Math Alert Program". Also, campus analysis of student needs also point out the areas of math and science as being the most deficient.

In terms of pursuing applications of the new and emerging learning technologies, it is important that we draw upon the educational research knowledge base, learning theory, and what we know and have documented

about good and sound educational practice. Given that context of national needs and the underlying strategic elements, any deliberate effort we undertake to apply the new and emerging learning technologies for the benefit of all learners must address the following:

- the program must be individualized and designed to dynamically respond to the learning needs as demonstrated by the competencies or deficiencies or the learner;

- there must be access to detailed learner management information including level of achievement on discreet learning objectives and competency elements relevant to the subject matter;

- there must be a high degree of multi-media interactivity;

- there must be provision for prompt and intermittent positive reinforcement;

- there must be highly motivational content and presentation modes;

- there must be the ability to extend opportunities for access to quality learning beyond traditional settings into homes, workplaces and community learning centers;

- there must be provision for the extension of learning time on task beyond that afforded by traditional institutions onsite.

Of particular importance in today's economic environment, our efforts to deploy learning technologies need to clearly demonstrate increased learning productivity and increased productivity of our teaching faculty and institutions in order to unequivocally indicate a high return on the public's educational investments. This is a particularly sensitive area since there is a growing body of evidence that illustrates the decline in school and learner performance is accelerating in the face of dramatically increasing public investment in the traditional public education model. There are also significant sensitivities to the inclusion

of this element as a "system requirement" that relate to collective bargaining issues and the fear of job displacement. These are not unfounded and provide an indication of the magnitude of the barriers to be confronted. One must keep in mind that it was not the bank tellers union that fought for the enhanced consumer access and productivity yielded by the installation of ATMs across this country.

In reference to the technologies that can be integrated as tools for education and training, there seems at this point in time to be no limit on the media forms or delivery means relative to our consideration. Audio, video, computer, graphics, and telecommunications technologies all can contribute to enhanced quality of the learning experience, increased productivity, and improved access to learning opportunities. The attached Figure 1 which appeared in *USA Today* illustrates an example of how one phone company views its future in the multi-media environment that integrates a variety of technologies and communications mediums. Figure 2 also indicates the activities of the Baby Bells in reference to cable and entertainment investments, thus illustrating the inevitable integration of these accessible, multi-media, highly motivational technologies.

In terms of collaboration, one can see in the private sector the collaboration emerging across industries. Figures 1 and 2 provide some indication of the extent to which industries are considering merging, being acquired, or pursuing significant joint ventures to position themselves for the future of integrated technologies. Public education can ill afford not to pursue similar collaborative efforts designed to shape the applications of these new, integrated, multi-media technologies to directly support education and training activities. Such collaboration can insure that the requirements of the education and training enterprise in this country drive some consideration of the capacity of the new and emerging technologies to deliver learning opportunities in their most sophisticated form to a variety of sites.

Where Are We Now? (Myth and Reality)

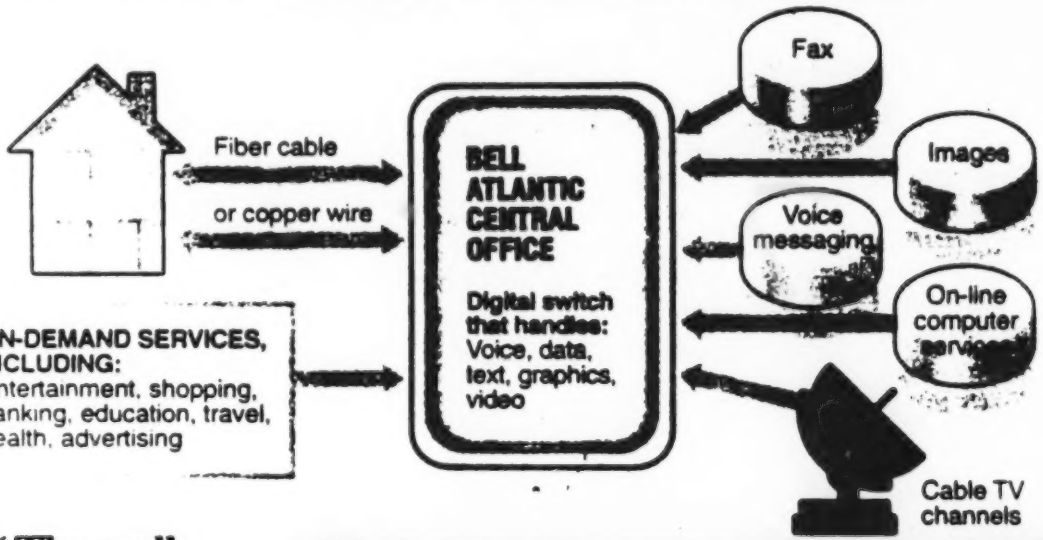
At the institutional level we have seen an evolution over the last decade and a half that began with online access to services such as Plato

FIGURE 1

Ruling opens door to union of telephone, cable, video

How Bell Atlantic sees the future

The regional phone company plans to offer everything from ordinary phone conversations to interactive services, such as movies-on-demand, via existing phone lines and a fiber-optic cable network it wants to build. A simplified view of how the network might look:

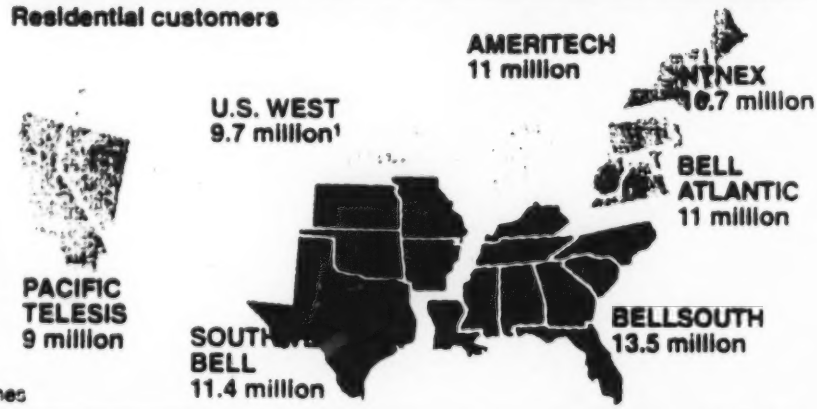


"The walls are coming down and here's one of the bugles being blown."

— Gus Hauser, who runs Hauser Communications, a cable company in Bell Atlantic's territory

THE SEVEN REGIONAL BELL COMPANIES

Residential customers



1 — Number of residential phone lines

Source: Bell Atlantic, USA TODAY research

By Marty Baumann, USA TODAY

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Baby Bells' activities in the cable and entertainment industries

	1992 REVENUE (billions)	1992 OPERATING CASH FLOW* (billions)	CABLE/ENTERTAINMENT VENTURES SO FAR
Ameritech	$11.15	$4.38	—
Bell Atlantic	12.68	5.05	Has five projects to deliver video programming in New York, New Jersey and Virginia
BellSouth	15.15	6.21	—
Nynex	13.16	5.05	Invested $1.2 billion in Viacom; is also the largest cable provider in the United Kingdom
Pactel	9.95	4.04	—
SW Bell	10.02	4.12	Owns cable properties in U.K., Israel; is buying two cable operations near Washington, D.C.
U S West	10.28	4.29	Bought 25% stake in Time Warner, owns cable properties in U.K., France, Hungary, Norway, Sweden
TOTAL	82.39	33.13	—

*Operating cash flow is revenues less operating expenses excluding depreciation and amortization

Source: Kidder, Peabody & Co.

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and other mainframe driven education and training applications. That evolution moved through phases that included (1) widespread use of stand alone microcomputers (which significantly complicated the life of teachers all across the country), (2) the "broadcast" of learning at the elementary and secondary levels on a national scale, (3) an integrated learning system approach, and now what appears to be (4) a technology/applications integration that includes student learning management and multi-media applications and the vision of fully integrated multi-media in an interactive mode delivered in ubiquitous fashion via a variety of telecommunications mediums. This evolution in the public education sector has been fraught with misunderstanding, overselling by the public and commercial sectors, and public sector expectations considerably out of line with public fiscal and technical capacity. As this evolution of learning technology applications moves further into an integrated distance learning arena that draws upon multi-media delivery systems including satellites, it would be well for us to keep in mind some of the historic difficulties caused by the difference between the technology myth and the reality of its applications and the demonstrable return on the public investment.

For example, in the 1980's, with the widespread introduction of microcomputing, public education, parent/teachers associations, and alumni groups went so far as to hold bake sales in order to purchase microcomputers for their children's classrooms. State education agencies all across the country measured the degree of their resident public school commitment to technology (and supposed return on public investment) by a ratio illustrative of students per microcomputer at the district and state levels. This metric did not take into account the fact that software may not have been educationally sound and that, from a classroom management point of view, these stand-alone microcomputers caused chaos for teachers seriously trying to make a difference for their students in the classroom. The rush to use and install stand-alone microcomputers resulted in teachers struggling to find acceptable software. Having found that software, students worked individually and thus, if time were available for all students to use the microcomputer(s), at the end of the school day, 25 separate students disks held the secrets of how each student performed. Unlocking those electronic student progress reports required that the teacher use the stand-alone computer in the building (or

have one at home) so she could ascertain what students had done while using the computer. In time, as networking technology improved and multi-disciplinary integrated learning systems emerged with graphics and sound, learner management information was captured automatically and detailed reports available at the individual class or school district level.

Now at the K-12 and post-secondary levels, we see a similar evolution with what is popularly known as "distance learning." The most widely used distance learning model today consists of satellite distribution of a live teacher with two-way audio interaction between teacher and distant students made possible through audio bridges and remote telephones. These services are frequently augmented by the use of voice mail, electronic mail, computer conferencing, keypad response devices or voice mail systems, to allow for student-to-student or student-to-faculty interaction at times other than the airing of the live instructional broadcast. This model, augmented by computer and telephone interactive technology, is a basic broadcast model. It is a model that originates a live teacher in one location and distributes the signal to multiple locations equipped for interaction through phone and other technologies. This model, unlike those associated with the use of more sophisticated computer assisted instruction models, does not, as popularly advertised, create a "paradigm shift." Indeed, the traditional instructional paradigm remains essentially unchanged.

Rather than shifting it to a new and improved instructional paradigm, the popular distance learning model merely extends the current paradigm which has been in place for over 200 years. One reason why all of the expenditures and enormous amount of human resource commitment has left the traditional instructional paradigm essentially unchanged is because the initiatives were not accompanied by adequate efforts to examine the traditional beliefs about instruction, learning and the contexts where they might effectively take place. Therefore, the technology has been for the most part an add-on, as an instrument of administration and less frequently instruction, and not a mechanism and opportunity for dynamic change and reform of the public education model at all levels.

It must be pointed out that though the current distance learning

model does not create a meaningful (and much awaited and often cited) paradigm shift, it has provided access to education and training opportunities that might not have otherwise been available to public school students, working adults, or corporations for improving employee performance. However, as educators, with the objective of enhancing educational quality, access and productivity, and with the desire to apply the learning technologies in a creative way to support educationally sound practice, this extension of the traditional model is not sufficient and cannot be our goal. In point of fact, the extension of the current model through the popular configuration of distance learning is diametrically opposed to many elements of what we know to be sound learning practice supported by substantial educational and learning theory research.

For example, the broadcast model of distance learning does not increase individualized programs that adjust dynamically to student learning performance. In fact, current distant learning programs in the broadcast model significantly decrease the individualization of programs and substantially reduces the degree to which a student can be interactive with his or her teacher. In addition, the programs are frequently of little motivational value, do not have any provision for addressing prompt or intermittent reinforcement, do not extend time on task, and do not provide individual or group information related to student performance on discrete learning objectives or related to specific student competencies and do not capitalize on the technology to extend learning beyond the traditional learning sites. In short, what has become extremely popular across the country and supported by multi millions of dollars in federal, state, and local public funding is truly not founded in sound educational theory, practice, or research. Perhaps most disturbing is the fact that this enormous investment in the application of educational technology has not contributed to improved pedagogy or a shift in the instructional paradigm to achieve the objectives related to enhanced quality, learning productivity or the National Education Goals.

Unfortunately, getting caught in the myth of the "silver bullet" personal computer or distance learning solution to our difficult and persistent public education problems brings with it a loss of context and a diversion of substantial resources away from the true mission of public education. The focus becomes superficial and often reflects frequency

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distributions and broad geographic (political) reach as measures of effectiveness. Unfortunately, those numbers quickly become accepted as a replacement for qualitative learning data or portfolios demonstrating student competencies and other true measures of return on public investment.

For example, popular distance learning programs and projects today typically site as a level of "effectiveness" the number of sites they reach, the number of states in which the signal is received, the number of students participating in the courses, and the number of hours of programming offered. This data has little or no relevance to the quality of the program, the level of productivity of the student or faculty member, the competencies achieved by the learner or the resultant return on investment for the citizens of this state and country. It is ironic that we, as educational scientists, get caught in the flow of technology use to a point where we use such imperfect and misleading measures and cite such irrelevant data to justify the expenditure of our public dollars. All public and private enterprises have a propensity to apply technology, and sometimes do so prematurely and for the wrong reasons. However, in this case, there is clear evidence that the application of technologies and the commitment of significant public investment, though addressing an objective of instructional access, is contrary to accepted learning theory and practice and merely extends an ancient and outdated model.

Our continuing pursuance of these models seems to illustrate that we have lost our identification with the basic mission of our educational and training enterprise and neglected our obligation to protect the public investment. Public education exists to provide quality educational experience. Quality must be defined by what the body of assessment and research data indicates. In short, quality education must yield competencies at the learner level. Those competencies are demonstrated by learner performance. Ultimately, that performance is reflected as productive work in the workplace. That productive work contributes to a competitive enterprise, one that likely contributes to a healthy economic environment. A healthy economic environment is a major characteristic of a mature and peaceful society. If we continue to merely extend the traditional instructional model with technologies that have the power to

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do so much more, we must realize that in so doing, we lose touch with the goal of our profession and neglect the focus on the individual learner. Since education is the prerequisite and essential foundation for achieving the valued outcomes related to competencies, performance, productive work, a competitive organization and a healthy economic environment, our loss of focus on mission can have devastating effects on the country's economic health. As we move forward in our attempts to effectively apply the new and emerging technologies to the learning enterprise, we must not lose the focus on the individual learner regardless of age, level of learning, or location. Our recent history in the technological arena indicates that we have lost that focus and it is time to renew it.

C. Some Learning System Requirements and the SUNY Developmental Project Experience

Taking into consideration the direction of the new technologies and the ability to integrate them, and considering what we do know about educational needs and sound educational practice, SUNY determined that there are several requirements of a systems design that we should adhere to as we engineer the new learning environment. Some of these requirements are:

- system design provides for the teacher as architect and manager of learning experiences;
- learning experiences tailored to the learner;
- use of multimedia technology;
- real time interaction, simulation, and feedback;
- extension of the traditional learning day and the traditional learning year;
- basing success and progression on achieved competencies rather than temporal measures;

- prompt assessment and reinforcement;
- capacity to extend the full sophistication of the learning system beyond the traditional school site and into the community;
- ability to handle content in a multi-disciplinary mode;
- presentation of material in various sensory modalities with preference determined by learner performance;
- presentation of learning experiences through varied strategies to include problem solving and exploratory learning.

With these learning system requirements in mind, the new environment for applying this system extends well beyond the traditional school setting. The new and emerging learning technologies allow for delivering sophisticated learning experiences to a wide variety of audiences in a wide and varied number of settings. Figure 3 indicates the kinds of audiences and locations for which the system should be designed. Though the new and emerging systems will have a capacity to reach multiple audiences in varied settings, if the public education system is to embrace these new technologies and capacities, they must build from the current traditional system in the classroom (Figure 4) to a community wide learning environment (Figure 5).

Developing Public/Private Partnerships:

In seeking to address these system requirements and the ability to extend learning opportunities into the community level, the State University of New York (SUNY) developed a working relationship with Instructional Systems Incorporated (ISI), the distributor of Computer Curriculum Corporation (CCC) computer-assisted instruction in New York, Massachusetts, and New Jersey. This relationship was established because (1) it was determined that many of the requirements set forth above were met by the CCC system (2) a New York State Department of Education Survey (1991) indicated that CCC was the ILS (integrated learning systems) used by far more New York schools than any other and

FIGURE 3

STATE
UNIVERSITY
OF NEW YORK

Computer Assisted Instruction With Live, Interactive TV Teaching

A Cooperative Research and Development Project
of Instructional Systems Inc.
and the State University of New York

For Whom

- K-12 students at risk of failure in traditional educational settings
- Postsecondary students in need of remediation
- Workers seeking new job opportunities
- Public assistance recipients and members of families seeking employability skills
- Disabled persons
- Marginally employed workers
- Non English speaking workers
- Incarcerated youth reentering the job market
- Probationers and parolees

Where

- Home
- Workplace
- Colleges and universities
- Public and nonpublic schools
- Libraries
- Community-based organizations
- Correctional institutions
- Human service providers
- Skills center

FIGURE 4

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The Technology-Enhanced Learning Environment

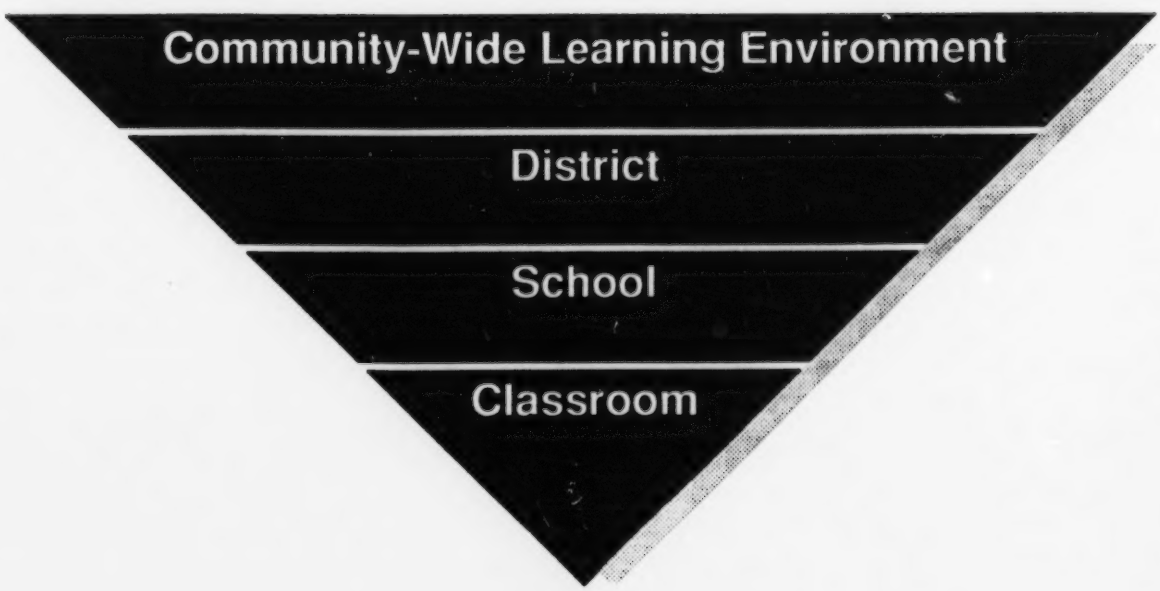

FIGURE 5

STATE
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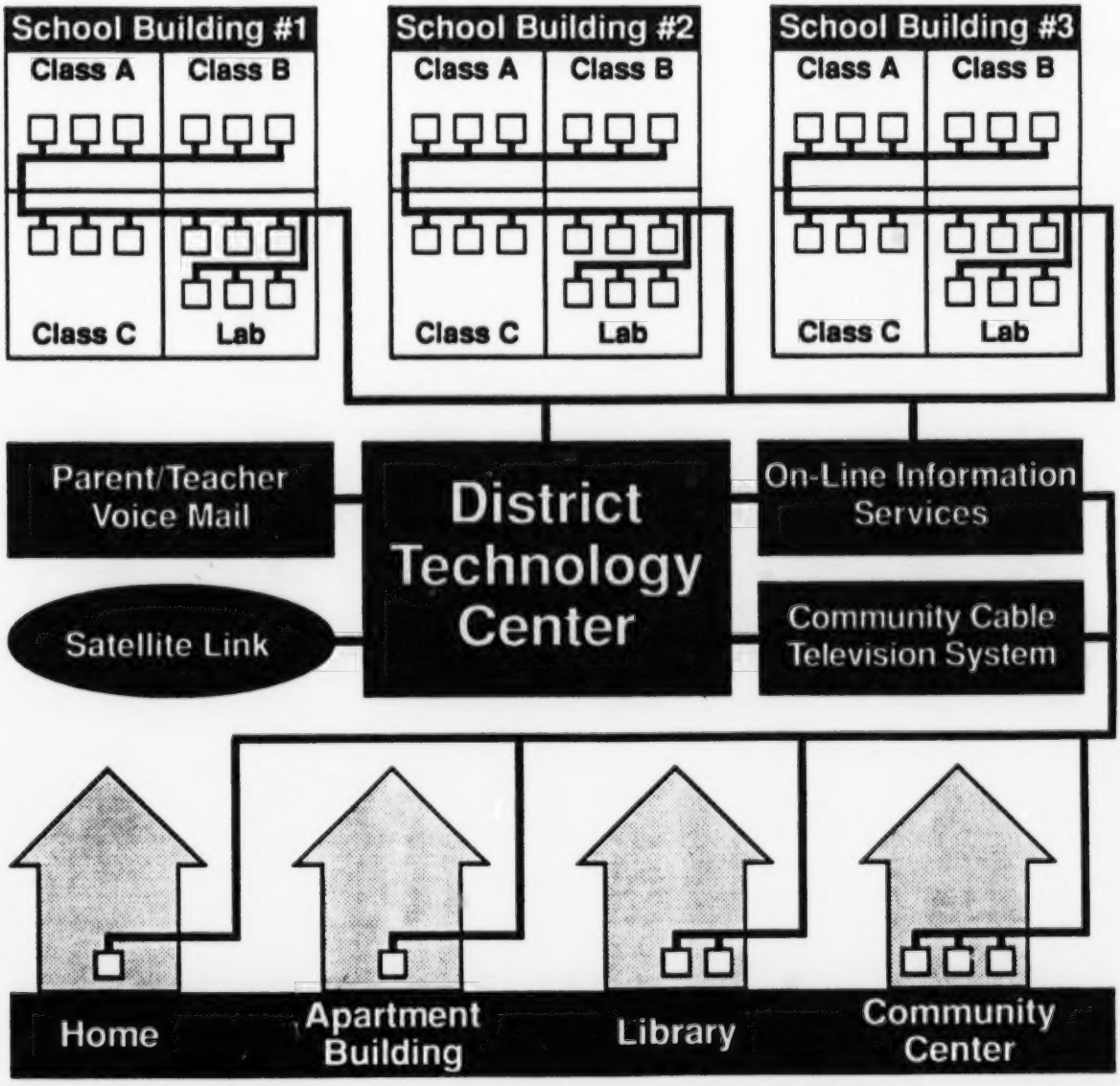
Community-Wide Learning Environment



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(3) that when complemented by the capacity of the State University of New York to deliver live teachers, there began to develop an interesting new model of integrating CAI with cable/satellite delivered instruction.

A cooperative developmental relationship emerged in 1991, the purpose of which was to determine how, with then current technological capacity, SUNY and ISI might begin to move the instructional model to more closely approximate the requirements set forth above. In pursuing that model, the deficiencies of each of the stand-alone capacities were addressed, in particular those of the SUNY distance learning model which adhered to the broadcast design discussed above. Developing this design also provided the opportunity for SUNY to gain experience in a new educational frontier where teacher training requirements would be drastically changed. This experience was deemed to be necessary if SUNY and its teacher training institutions were to keep pace with what promises to be a true shift in the instructional paradigm.

The SUNY/ISI collaboration was manifested in the Syracuse City School District at Nottingham High School, where it was determined that the mathematics content area was of highest priority. Therefore, the Math Sequence I curriculum was selected as the focal point for these developmental efforts since it also represents an area of high priority on the national level. In order to extend the learning opportunity beyond the school and into the home, it was decided to use laptop computers. Though the full multimedia capacity of the CCC system would not be available via phone lines to the home, it was determined that in this initial stage, the technology would be used to its current capacity to achieve the requirements. Students in need of supplemental assistance with the mathematics curriculum were selected to participate and provided with laptops for home use via phone line. To add the element of the live teacher into the home, the participation of Adelphia Cable Communications was solicited to provide one hour a week during the school year. Thus, Nottingham High School created a program known as "Mathematics TV Teacher" aired for one hour every Wednesday evening that school was in session. The live TV teacher used the CAI student management information collected from school and with laptop use in the home to make determinations as to what content would be focused upon in the one hour weekly sessions. Thus, the one hour was not a prearranged

program planned weeks in advance, but rather a program driven by the performance of students as reflected in the student management information collected by the CAI system. Though the program was available to all students in the community via the cable system, the content was of particular relevance to those students selected to participate in this pilot developmental project since the program content was derived from their performance data generated by their inhome laptop use. This same model is now in operation in New York City Districts #12 and #5 with cooperation from Cablevision of New York City.

There are many elements of this extended learning environment in Syracuse, New York City and Boston that are departures from the traditional educational model. For example, taking home valuable computer equipment for use in the home required the acknowledgement and participation of parents in this experiment. This additional degree of responsibility required considerable forethought to execute efficiently. Most parents were extremely enthusiastic about the participation of their children and equipment loss and damage was minimal. The project was designed to extend the school day and learning experiences for those students in Math Sequence I deemed at risk of failing. Therefore, this experiment was an attempt to directly address the learner needs and was viewed as a positive step by school professionals, parents and by Adelphia Cable, which provided the weekly air time for the live teacher.

Preparing the teachers to participate in this multimedia project, which included appearing and "performing" on television also required considerable effort. SUNY, in conjunction with the SUNY College at New Paltz, the New York State Theater Institute, and television production staff at SUNY's New York Network, developed an institute consisting of a five day program entitled, "Teaching and Learning on Television," which included topics related to the methodology and pedagogy of distance learning, resources for TV teachers, copyright and intellectual property issues, performing for the camera, production of video-based instruction, and familiarity and use of the computer assisted instruction program. This program was offered as a summer institute in 1993 and again in 1994 (see Appendix A). It was attended by the Syracuse teachers participating in the project, as well as by teachers from districts in New York City and Boston who were implementing the program in 1994. In

addition, the institutes attracted large numbers of SUNY faculty members who were interested in or participating in distance learning programs on their campuses.

Though this initial effort commenced in 1991 as an application of the technology that existed then, and therefore used delivery via cable and phone system to accomplish, recent developments indicate that we will soon be able to achieve a vision such as the following which is the goal of this project:

Karen Johnson is a fourth grade teacher in Buffalo, New York. She has been trained on a sophisticated integrated learning system that includes a high level of student motivational, interactive, video, graphics and audio reinforcement. Karen's students used the system at school and in their homes. Some of Karen's students are adults and they use the system at their workplaces. The home and workplace access has been provided by the cable company that serves Buffalo through the magic of fiber optics and digital compression techniques. Since in-home systems are not expensive, they have been provided to students deemed to be at risk of failing and funded by Chapter 1. In the workplace, those employees most in need of basic skill competency upgrading were selected and that program is funded by state and federal workplace literacy programs. Karen is able to easily monitor the progress of her 125 students by virtue of the student management data that is collected and reported to her at regular intervals she has predetermined. In this case, the "electronic report cards" go to her, not two or four times a year, but weekly. These reports indicate precisely where each learner is having difficulty on a series of objectives and Karen can ask that students having similar difficulties be listed for her so she can target some special attention to those specific learners. In order to provide congruence for the students with the computer curriculum and their classroom curriculum, Karen is able to use the student CAI reports to create an individual education plan (IEP) for each student. For one or several students having been identified as having difficulty, Karen, through her system

interface, asks that the next time the student "signs on," that she be alerted through an audible "urgent message" indicating that the student in need is on the system. When so notified, Karen enters the student ID number and requests access to the student's active screen. In seconds, Karen appears in a video window on the student's workscreen and ... "Hi Sally, I see you are having some difficulty with multiplying fractions. Let's see if I can give you some help and maybe show you a brief video segment that will help you understand the rules we need to keep in mind."

This vision has moved one step closer through this cooperative project between SUNY, Instructional Systems Incorporated, and local schools. Moving us further toward achieving this vision, Computer Curriculum Corporation (CCC) and Zenith Electronics recently demonstrated the role that the emerging information highway can play by demonstrating low cost access to local area networks over standard cable TV home subscriber facilities (see **Appendix B**). The CCC software is fully compatible with Zenith's communication products and opens new doors for the delivery of education into the home. Children will now have the ability to use the full CCC multimedia software at home, in the classroom, in the library, or in any of the sites listed earlier. This breakthrough in multimedia educational delivery to the home announced in February 1994 is a clear indication that the cooperative venture between SUNY and Instructional Systems is moving in a direction indicated by learner needs and supported by sound educational practice and the technological capacity being developed today.

It is interesting to note that concurrent with SUNY's activities, Kodak Corporation was experimenting with similar CAI capacity in a plant in Rochester, New York. In September of 1992, Kodak staff made a presentation to the staff at the State University of New York describing their effort to apply computer assisted instruction in the workplace to address learning deficiencies of their employees. The specific Kodak objectives were to close the basic skill competency gaps that were contributing to decreased quality of products and services and to generally enhance the foundation skills of all employees. Their voluntary program demonstrated overwhelming success in both learner performance

and cost effectiveness. Their data illustrated that in their pilot with 100 employees, the cost for implementing the computer-based instruction was $4,000. Similar costs for the implementation of a traditional model was $23,000. In terms of educational achievement, for every 100 hours of instruction, the traditional approach achieved one grade equivalent gain. Similarly, for every 100 hours of instruction on the computer assisted instruction system, there were gains of 8 - 12 grade equivalents. In the fall of 1992, Kodak reported to SUNY that they too were exploring on a pilot basis the installation of learning capacity in homes for their employees. The Rochester, New York-based Kodak workplace program that yielded the positive results indicated above has now been expanded to a Kodak worksite in Massachusetts.

As a spinoff of the initial SUNY project and also in the Rochester, New York area, SUNY is now participating with Rochester Telephone Corporation, Instructional Systems, Inc., local schools, BOCES, the SUNY teacher training program at Brockport and the Monroe County Community College to expand upon the "Rochester Area Interactive Telecommunications Network" and pursue the vision noted above using ISDN. It is anticipated that in coming months a pilot test will be conducted in 100 households allowing children and adults to benefit from the access to the interactive, multimedia curriculum offerings. These offerings have the advantage of central learning management data collection which can support strong articulation with the in-school program. Indeed, it is possible to explore eliminating the disruption of the typical remedial (Chapter I) "pull-out" program by shifting some of it to this inhome model. This inhome model also holds significant implications for the gifted students since many schools can no longer afford them apppropriate offerings.

This SUNY developmental effort and its evolution from two distinct mediums (cable/phone) to what promises to be one integrated network, and other evidence being generated by those implementing the new and emerging technologies across the globe, make it clear that we are on the verge of a capacity that can cause a true paradigm shift rather than a simple extension of the current pedagogical model. SUNY, with this developmental project, has attempted to make a small contribution to achieving that shift and preparing teachers to lead it.

II. Other Technology-Supported SUNY/K-12 Efforts to Enhance Learning Opportunities and Support Staff Development

The State University of New York has always played a prominent role in support of the public education sector. Of significant importance has been the emergence of the network of SUNY teacher training institutions which prepare and offer continuing professional education to a large share of the teachers in New York State. More recently (May 1994), in direct support of the public, K-12 education efforts to pursue A New Compact for Learning, the SUNY Board of Trustees approved resolutions aimed at achieving:

- Development of improved collaborative models of preservice and inservice teacher preparation and professional development appropriate to the schools of the 21st century.

- Enhanced campus work in collaboration with local school districts to articulate student performance standards and to help design and implement methods of assessment that enhance student achievement.

These recently stated action objectives will surely yield a number of collaborative efforts where technologies can be productively applied. However, there are many such collaborative efforts underway at present and the selections described below are exemplary of those.

A. Distance Learning

A recent survey undertaken by the SUNY Presidents' Task Force on Distance Learning indicates that many campuses are involved or actively planning local/regional distance learning efforts in collaboration with the public, K-12 sector. Approximately 6 campuses currently have offerings for local schools delivered through a variety of mediums including cable, microwave and phone lines. Projects such as that noted above involving SUNY Brockport and a number of local schools are exemplary of the role

broadband and ISDN capacities can play in enhancing offerings to local school students and staff. Those campuses reporting the offering of distance learning courses for local schools include SUNY-Brockport, Herkimer County Community College, Alfred College of Technology, Canton College of Technology, SUNY-Potsdam, SUNY-Oneonta and SUNY-New Paltz. Others including SUNY-Oswego indicated that they are in the planning stages.

There have long been strong relationships between SUNY teacher education programs and local schools. As the survey indicates, many of those SUNY institutions are now moving to electronic delivery of professional development opportunities. Other applications of the SUNY campus distance learning technologies are emerging in support of 3-1-3 programs which have operated in the "physically transport the students or faculty" mode for many years. With a SUNY focus on shortening the time it takes to secure a degree, applications such as 3-1-3 or advanced placement will surely emerge with greater frequency. These are applications particularly worthy of pursuit since (1) they make far more productive use of student and faculty time and (2) they have direct economic benefits for the parents of the students who ultimately attend SUNY campuses. That kind of incentive and support from the community is extremely valuable.

Further detail regarding the SUNY system-wide distance learning survey results can be secured by writing to the author.

B. Regents Review Live

Several year ago the Rockland, Northern Westchester/Putnam, and Hudson River Teacher's Centers in conjunction with Continental Cablevision and TKR created and offered a "REGENTS REVIEW LIVE" series that aired programs on each of the two participating cable companies to help students prepare for the New York State Regents exams. Two-hour review courses in U.S. Government, Spanish, Global Studies, Earth Science, Sequential Math I, II and III, Physics, Biology, English and Chemistry were offered first from the Continental Cablevision studio and then from the TKR studio. In 1991 SUNY Central proposed a test of using the SUNYSAT statewide distribution capacity to air the series statewide. In so doing,

the on-air teacher did not have to repeat their sessions and the number of participating students would be increased nearly 200 fold. A 1991 successful statewide test, which aired the Sequential Math I review program, has now grown into an annual statewide, live airing of the entire 22 hour Regents preparation series with the participation of nearly all cable companies in New York State. This straightforward application of existing public telecommunications facilities in conjunction with K-12 institutions and the private sector cable companies illustrates how collaboration can extend the benefits of existing programs to geographically dispersed students. Many communities where cable penetration is light found that the local school district had a satellite dish and were willing to host Regents Review program reception rooms where students could participate in the live review sessions with their own teachers in attendance.

This statewide SUNY/K-12 model can readily be extended to support 3-1-3, advanced placement, and teacher training. The interactivity of such programming will increase substantially as terrestrial-based compressed digital systems are installed linking communities across the state. The NYSERNet plans to develop a statewide T-3 network and the SUNY plans to increase the number of campuses with access to the Albany uplink site will surely accelerate the development of these programs.

C. Satellite Delivered Professional Development

In 1991 SUNY Central in conjunction with Dr. Dennis Littky, Principal of Thayer High School in Winchester, New Hampshire (and a nationally known "school reformer" associated with Ted Sizer's Coalition of Essential Schools), secured funding for the offering of a live, monthly, nationally-aired staff development series produced by SUNY's New York Network. At that time (and yet today it) the "Here, There and Everywhere" series was the first national teacher training program to originate live from a school. The monthly program represents a new teacher training model that transforms the traditional "lab school" into a dynamic, interactive network of teacher educators, pre-and inservice teachers, students, parents and other members of the community.

In 1994, with funding from Annenberg, Dr. Littky and some of his staff migrated to Brown University where the Annenberg Institute for School Reform was created. Supported by Annenberg and the CPB Math/Science initiative and sporting the new name of "Educator's Guild", the series will now originate from multiple sites including New York City, Chicago, Los Angles and San Francisco. SUNY will continue to play a role in the distribution of the program and may originate future teleconferences from Thayer High in Winchester, New Hampshire and the programs originating at New York City high schools.

This SUNY experience and the resulting teacher training (electronic lab school) model hold clear implications for SUNY's role in support of New York's school reform efforts. Among the 400+ schools nationwide, many New York schools participated in the original "Here, Thayer and Everywhere" program and the New York local school audience will surely grow now that programs originate from the major urban school districts across the country, including New York City.

A related and concurrent series was developed with the Albany BOCES. This series was supported with Federal funding and offered nearly 60 hours of live professional development per year covering topics such as Cooperative Learning in the Math/Science Classroom, Gender Equity in Math, Constructive Geometry, Family Math, Applying the New Standards of Excellence in Mathematics and Science Education to the Classroom and many other programs over a four year period.

With the emerging capacity to extend access to the SUNYSAT uplink to several SUNY teacher training institutions, these experiences stand as tested models, found useful and accepted by dozens of schools in New York and hundreds across the U.S. .

D. The Great Lakes Collaborative

In 1991, SUNY Central, in collaboration with the Wayne County Regional Education Service Center in Michigan, was awarded a major role in the creation of a three state network of 81 schools connected via Internet. Each school site was awarded hardware and software to enable

student and teacher creation and sharing of multimedia instructional materials in support of math and science curriculum. A central feature of the project is the "Explorer", a user-friendly software tool which allows educators and students to easily navigate their way through the maze of broad-based resources to find the right material based on curricula, learning objectives and grade level. These materials are available on-line immediately (or the software indicates where they can be obtained) and are interactive. Teachers and students are also provided access to a myriad of other information resources through Internet.

SUNY has played a role in the selection of the 23 school sites in New York State (See Appendix C) and provided the core of the staff development and continuing support services to the schools. A capstone event in 1994 was the conference conducted at SUNY-Oswego entitled "Teaching in the Information Age: Linking K-12 and Teacher Education". This conference provided a unique opportunity for SUNY faculty and local school sites to share their experiences with creating multimedia materials and communicating and securing resources via the Internet. SUNY is now planning programs for 1995 that will also focus on the use of the Internet and K-12 school staff will be invited.

The above SUNY projects provide an indication of current efforts to deploy learning technologies in partnership with, and in support of the public K-12 sector. Those mentioned above have had involvement and in some cases funding support from the SUNY Central Office of Educational Technology. There are several other efforts that have been developed locally that hold promise for systemic SUNY/K-12 initiatives. Indeed, some 800 collaborative programs between SUNY campuses and local schools are described in the publication entitled SUNY and the Schools: A Guide to SUNY/School Partnerships. In addition, there are a number of other substantial SUNY system-wide initiatives that are directly aimed at support of public school reform efforts that, to date, do not have a technological component. Those efforts include:

- College Expectations: The Report of the SUNY Task Force on College Entry-Level Skills (1992) which lays out the information and skills that students should master before they enter as freshman.

- College Transition Course, a flexible curricular outline being designed by a team representing SUNY, the schools, CUNY, the independent sector, the New York City Board of Education, parents, and students. The coiurse will be offered by high schools to their juniors or seniors to help ease the transition to college.

- College credit in high school is being offered by a number of SUNY institutions in addition to those mentioned above that use technology to do so.

- Integration of the last two years of secondary school with a college curriculum is being pursued by SUNY community and technical colleges for those students not planning to seek a baccalaureate immediately after high school.

- Performance-based assessment programs are being developed by fifteen SUNY college/school teams across the state. This is an effort to move away from multiple choice and short-answer testing toward students' demonstrating their knowledge more fully and persuasively in projects, demonstrations, and portfolios.

- The SUNY Mathematics Alert Program offers juniors a confidential assessment of their math skills in relation to the freshman math sequence for two majors at a SUNY campus of their choice. In 1993-94, the first year of the program, 335 high schools tested 40,000 students.

Many of these systemic efforts could benefit significantly by the appropriate application of technologies to enhance access and improve productivity. For example, the Mathematic Alert Program assessment component is a multiple choice, pencil and paper test that could easily be converted to an online version at the local, regional or statewide level. This application of technology for data capture and aggregation could improve efficiency and enhance access for high schools and students desiring to participate. One might also consider (1) using the SUNYSAT system for statewide distribution of selected elements of a college transition course being developed by the team noted above, (2) offering

selected advanced placement opportunities statewide (as is now the case for the "Regents Review Live" program and "SUNY by Satellite" business courses) to enable more equitable access to these opportunities, particularly for rural and urban school districts whose fiscal situation has caused the reduction of such offerings, and (3) using local/regional cable and phone networks to enhance access and improve efficiency of the Tech Prep, 3-1-3 and professional development programs.

III . Conclusion

In New York State public education is supported by its residents as one, contiguous system of learning opportunities that encompasses a lifelong array of the broadest scope of high quality programs available anywhere in the world. The public investment in this lifelong system rivals and surpasses that of many countries. Though administered by distinct policy and governance boards (The Board of Regents and the SUNY Board of Trustees), the New York consumer of learning services rightfully expects and is demanding greater responsiveness and articulation of programs across this continuum. This is evidenced by the myriad of efforts described or referenced above that illustrate articulation of the two public systems. In nearly every case these "partnerships" can be directly supported and enhanced by the thoughtful, learner-centered application of technology that encompass all or most of the "learning system requirements" outlined in Section I, C. Deing learner driven, not technology driven is the key to valid applications that are resistant to obsolescence and afford a higher return on the public investment

As collaborative SUNY/K-12 projects evolve and become supported by the emerging learning technologies, the distinctions between the political organizational bounds will blur. As this phenomenon materializes, individual citizens and the business sector will benefit from the genesis of a "New York State System of Education and Training". The financial industry provides some indication of the direction of this evolution since its electronic consumer service points (ATMs) rarely serve but one banking organization. If you have used such a device, you are acutely aware of how it has improved efficiency and access to service. At the same time, it is unlikely that you ever noticed what banking interests

were served, other than your own. That is the essence of "client-centered"!! We must design and implement our system to be similarly learner-centered!!

AN INSTITUTE

Teaching and *Learning* on *Television*

August 1–5, 1994
Albany, New York

Teaching And Learning On Television

The educational power of Public TV programs like *Sesame Street* an *Nova* is demonstrated every year as they continue to teach and inspir millions of children and adults. As television camcorders and othe video technology become more available to classroom teachers : every level, educators can now create their own video-base instructional programs including *"distance learning"* project: Although the TV equipment may be readily available, teachers als need the knowledge and skills to create pedagogically sound an visually exciting programs—as well as guidelines on how to use TV i the classroom with maximum effectiveness.

An Interdisciplinary Distance Learning Experience With Presenters From Three First-Rate Institutions

The *New York Network*, the television production and transmissio arm of the *State University of New York*, in collaboration with th Communication Department at the *State University College : Fredonia* and the *New York State Theatre Institute* (NYSTI) hav pooled their considerable experience and research to develop an present a series of short-form institutes for teachers who wish t originate or utilize video-based distance learning. *Instructiona Systems, Inc.* (ISI) brings their Computer Assisted Instruction expertis to the institute.

Five Days of Intensive Training

The Institute, running 5 consecutive days, will preser materials on three tracks: Theoretical, Performance, and Productio Topics include, Methodology and Pedagogy of Distance Learning, Th History and Development of Instructional Television, Copyright an Intellectual Property Issues, Labor/Management Issues, Performing f the Camera, Production of Video-based Instruction, Understanding a Utilizing Interactive Techniques at a Distance, Transferring Classroo Lesson Plans to the Distant Classroom, Discussion of Delive Systems (satellite, fiber, ITFS, microwave, etc). Each participant w have daily opportunities to work in the television studio with a staff distance learning professionals. Each will be expected to develop presentation in their instructional field, and then present it on-came combining all the elements of distance learning that have be cultivated throughout The Institute.

APPENDIX B

COMPUTER CURRICULUM CORPORATION

1287 Lawrence Station Road
Sunnyvale, CA 94089

NEWS

FOR IMMEDIATE RELEASE

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(408) 541-2164
Michael Caputo
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Computer Curriculum Corporation Brings America's Schools Into the 21st Century at CosmNet '94

SuccessMaker™ Educational Software Helps Students Gain Access to the Information Highway

WASHINGTON, D.C. -- Computer Curriculum Corporation and Zenith Electronics Corporation are teaming up at CosmNet '94 to demonstrate the role of education on the information highway. Zenith's HomeWorks™, a PC LAN gateway, provides low-cost access to local area networks over standard cable TV home-subscriber facilities. Computer Curriculum's educational software, SuccessMaker™, is fully compatible with Zenith's communications products and will open up new doors for the delivery of education and educational technology. Children will have the ability to access SuccessMaker at home, in the classroom, and in the library, supporting the goal of "anytime, anyplace" learning.

Computer Curriculum's SuccessMaker includes over 3,000 hours of activities, featuring full-motion video, animation, computer graphics, and digitized sound. These features combine

(more)

A Paramount Communications Company

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to produce an exciting, interactive learning environment that teachers can use to meet the individual needs of students. Specific subjects covered in the SuccessMaker software include mathematics, reading, language arts, writing, science, and life skills.

For more than 25 years, Computer Curriculum Corporation has been developing state-of-the-art multimedia educational software for America's schools. Computer Curriculum's newest version of the personalized learning system, SuccessMaker, demonstrates the company's commitment to furthering the nation's education goals and helping students gain access to the information highway.

The use of computers in education has shown the potential to motivate students, personalize instruction, combine disciplines, and enhance both teacher and student productivity. Schools that incorporate technology into the curriculum have reported higher learning rates, lower dropout rates, increased student self-confidence, and better problem-solving skills.

Today, state education systems are realizing the importance of technology in the classroom. In the November 17, 1993 issue of Education Week, Gordon Ambach, the executive director of the Council of Chief State School Officers, argues "There is no way we can achieve [the nation's education] goals for all our children without an increased use of telecommunications."

National, state, and local education leaders are heeding Ambach's word and bringing technology into the classroom. States such as Florida and Utah have plans to implement

/ more /

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statewide on-line educational systems, therefore linking their students into the information highway. Computer Curriculum is playing a major role in providing technology that helps states such as these pursue educational excellence and meet the nation's goals.

Headquartered in Sunnyvale, California, Computer Curriculum Corporation pioneered technology-based learning systems in 1967. Today its multimedia learning systems provide instruction to over one million students in thousands of schools across the country. Computer Curriculum is a division of Paramount Publishing, the world's largest publisher of educational materials. Paramount Publishing is the publishing operation of Paramount Communications, Inc., a global entertainment and publishing company.

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THE GREAT LAKES COLLABORATIVE TECHNOLOGY MINI-GRANT STATE WIDE CONFERENCE MAY 25 and 26, 1994

Year One Schools

Huntington School, Syracuse, Onondaga County
Roberto Clemente School (I.S. 195), New York City, New York County
Raphael Hernandez School (I.S. 116), Bronx, Bronx County
Arbor Hill Elementary School, Albany, Albany County
Broadway Junior High School, Elmira, Chemung County
Carry E. Thompson Elementary School, Croton-Harmon, Westchester County
Jefferson Middle School, Jamestown, Chautauqua County
North Park Middle Academy, Buffalo, Erie County
Bedford Village School (P.S. 3) Brooklyn, Kings County
Crispus Attucks School (P.S. 21), Brooklyn, Kings County
Andrew J. Townson School, Rochester, Monroe County
Salmon River Elementary School, Ft. Covington, Franklin County
Thousand Island Middle School, Clayton, Jefferson County

Year Two Schools

Public School 14, Yonkers,Westchester County
Barker Central Middle School, Barker, Niagara County
Algonquin Middle School, Averill Park, Rensselaer County
Fox Lane High School, Bedford, Westchester County
Longfellow Elementary School, Mount Vernon, Westchester County
St. Joseph Public School, Malone, Franklin County
Micro Community Magnet School at West, Newburgh, Orange County
Columbus Elementary School, New Rochelle, Westchester County
J.M. McKenney Middle School,Canton, St. Lawrence County
Colton-Pierrepont Central School (K-12), Colton, St. Lawrence County